remaining constant) is a logarithmic function was plainly indicated in the last paragraph but one in my second paper in NATURE, p. 277. In my paper in the *American Journal of Science*, Feb. 1875, p. 130, a formula was given at the close of the paper, p. 137, which is equivalent to Hinrich's formula (1), calling τ the time of exhaustion (or number of lifts), and s the strength of the muscle obtained with a dynamometer, and

$$\tau = \alpha (s - \beta)^v \qquad (2)$$

where α and β are constants. If the dynamometer gave the real strength in kilograms, β would equal w. In the series published in NATURE, s was obtained in another way, there described, and β was zero (nearly); v is a function of the weight. So that Hinrichs' formula does not seem to differ essentially from (2). In giving this formula, I stated expressly that I did not wish to discuss this equation at present, as the constants had not been determined with satisfactory precision. I take this occasion to repeat that statement.

Another point to which it may be well to call attention is, that in exhausting the arm with heavy weights very little pain is felt. With light weights, however, the pain is very great.

Our knowledge of this whole subject is yet so fragmentary, and the subject itself is so complex, that we can only hope to represent our knowledge by empirical formulæ. The best service is to be rendered in the direction of careful experiment. I shall therefore devote a few years to the work outlined in my paper in the *American Journal of Science*.

Washington University, St. Louis, Mo., April 28 F. E. NIPHER

Physiological Effects of Tobacco Smoke

Is Dr. Krause (NATURE, vol. xi. p. 456, vol. xii. p. 14) acquainted with the manner in which cascarilla bark modifies the physiological effects of tobacco smoking? The addition of a few very small fragments of the bark can hardly be supposed to materially affect the amount of carbonic oxide produced; and yet, with such an admixture, the strongest tobacco may be smoked by a tyro without, in most cases, the production of the usual nauseating effects. Loss of appetite, thirst, vascular and nervous depression are sometimes produced if such a mixture is smoked in excess. On the other hand, if Dr. Krause's theory, that the nausea, &c., of tobacco smoking is due to the carbonic oxide inhaled, be admitted, the question is suggested whether some of the volatile products of burnt cascarilla bark are antagonistic in their physiological action to the gas in question? C. E. S.

OUR ASTRONOMICAL COLUMN

NEW VARIABLE STAR (?).—Mr. J. E. Gore, of Umballa, writes with reference to a star of about the 6th magnitude noticed on the 13th of January about 1° north, following θ Leporis, and not having found it in Harding's Atlas or in Lalande, or the B. A. C., he supposed it might be a new star. "It is of a reddish colour, and is in the same low-power field with, and about 25′ north of (a little preceding) the 7m. star Lalande 11778 . . . It is closely followed by two small stars which formed with it a curved line." From this description the star is evidently VI. 58 of Weisse's first Catalogue, observed by Bessel early in 1825, and estimated 6·7 magnitude, the small stars preceding it being Nos. 68 and 78 of the same hour. It is not found in D'Agelet, Lamont, or in any other catalogue we have examined, of previous date to that accompanying Heis's Atlas, where it is entered 6·7, but erroneously identified with VI. 78 of Weisse's second Catalogue, instead of VI. 58 of his first. (The large number of similar errors in Heis's references is a serious defect in a work otherwise of so much value.) Mr. Gore mentions that he had not remarked, up to the middle of April, any variation in the star's light, but it evidently requires further examination, and may yet appear on our rapidly extending list of variables.

THE BINARY STAR ζ HERCULIS.—If good measures of this star are obtained during the present season, we may expect to know the elements of the orbit with considerable precision. Dunér's results, founded upon measures 1826–69, will be the best so far published, but he did not regard them as definitive; they will no doubt be very useful in any further investigation, and for this reason are here subjoined:—

Peri-astron passage 1864·23

Node	45° 56′	Excentricity ...	0·42394
Node to peri-astron on orbit ...	250 50	Semi-axis ...	1″·223
Inclination ...	34 52	Period	34·221 yrs.

PETERS' ELLIPTIC COMET 1846 (VI.).—This comet, which was detected at Naples on the 26th of June, 1846, by Dr. Peters, now Director of the Observatory at Clinton, New York, was calculated by Prof. D'Arrest, and in a more complete form by the discoverer himself, who, in a memoir published in the Transactions of the Naples Academy in 1847, found the time of revolution 12·85 years, but with an uncertainty of ± 1·61 years; in a subsequent communication to Brünnow's *Astronomical Notices*, he gave elements for 1859, including the effect of perturbations of the planet Saturn, which, however, he shows to be liable to very considerable doubt, on account of the observations in 1846 being insufficient to fix the mean motion at perihelion in that year within narrow limits. It is to be remarked that in 1846 the comet appeared under nearly the most favourable circumstances possible for observation, and at the time of discovery the comet was distant from the earth less than 0·6 of our mean distance from the sun, yet Dr. Peters found it very small and faint, and unless the perihelion passage should happen to fall about the same time of the year as in 1846, it might be exceedingly difficult, if not impossible, to recover it. The only hope of doing so is in keeping a close watch in the late spring and early summer, upon those parts of the sky indicated with different suppositions for date of perihelion passage, say from May 15 to June 15, which are wholly in south declination, a circumstance that will render the assistance of observers in the other hemisphere very desirable. To give an idea of the comet's track in the heavens when the perihelion falls in May, we assume the 15th and 25th for the passage by this point of the orbit, and thus have the following positions:—

In perihelion, May 15·0.				In perihelion, May 25·0.		
	R.A.	Decl.	Distance	R.A.	Decl.	Distance
May 15	256°·5	50°·0 S	0·594	228°·8.	55°·8 S	0·600
„ 25	256 ·5	42 ·2	0·552	231 ·1	48 ·4	0·561
June 4	255 ·9	32 ·8	0·538	233 ·4	39 ·2	0·546
„ 14	255 ·3	23 ·1 S	0·555	235 ·8.	29 ·4 S	0·564

The least distance between the orbits of the earth and comet is about 0·53.

Considering the uncertainty in the mean motion deduced from observation in 1846, it is quite within possibility that a perihelion passage may occur as late as the summer of the present year, and it may be worth while to institute a search upon that supposition.

MINOR PLANETS.—No. 26, *Circular zum Berliner Astronomischen Jahrbuch*, just issued, contains new elements and an ephemeris of No. 114, Cassandra, and corrected ephemerides of No. 71, Niobe, and No. 128, Nemesis. The period of revolution assigned to Cassandra for November 1872 is 1598·5 days. Several of this group are now adrift, the elements not having been determined with sufficient approximation to keep them in view. The planet found by Borrelly at Marseilles, 1868, May 29, and that detected by Pogson at Madras on November 17 in the same year, are thus situated; both travel beyond the limits of our ecliptical charts, which contain very small stars.

OUR BOTANICAL COLUMN

THE PANDANEÆ.—A fine series of Pandanus fruits has recently been received at the Kew Museum from Mr. John Horne, of the Botanic Garden, Mauritius

These fruits form the first consignment of a quantity collected in Mauritius and Seychelles by Mr. Horne for transmission to Kew, as material for the *Pandaneæ* in the forthcoming Mauritius Flora, and will form a valuable addition to the Museum collection. The fruit-heads of the *Pandaneæ*, like the cones of the *Piceas*, are very difficult to preserve entire except they be kept in fluid, and even then, if they are gathered too ripe the single drupes are apt to separate from the central axis. Those just to hand from Mr. Horne are the best set ever received at Kew, inasmuch as they appear to have been carefully selected and gathered before they were too ripe, wooden tallies with numbers *cut* in them firmly fixed upon each specimen with copper wire, and the whole sown up tightly in stout sacking or canvas and placed at once in rum. In this way the collection contained in five small barrels arrived in perfect safety at Kew, where the specimens, after being taken from the spirit and the canvas coverings cut away, were securely enclosed either in a network of thin copper wire or fine strong cord and gradually dried. We mention these facts because travellers and collectors too frequently send home specimens of Conifers, Cycad cones, or others of a similar nature simply rolled in paper or packed in sawdust; in the one case they dry and fall to pieces immediately upon opening, while in the other the sawdust absorbs moisture, and the fruit or cone simply rots and becomes quite worthless. Another advantage in sending woody fruits like the *Pandani* in fluid in the manner above described, is that they can be removed, dried, and mounted on wooden stands, by which they are more convenient for examination, and occupy much less space, and are manifestly more economical both for public and private collections than when preserved in large glass jars in alcohol. The collection, numbering some twenty-three heads of fruits, sufficiently illustrates the variety of form and size in the different species, the largest being some thirteen inches through, and the smallest not more than two inches. Mr. Balfour, who accompanied the Transit of Venus Expedition to Rodrigues, has also paid special attention to the *Pandaneæ*, and his collections, preserved, we believe in a similar manner, have recently arrived in this country.

SANTAL VERT.—Under the name of *Santal Vert*, or false sandal-wood, a dark green, close-grained wood, somewhat like *Lignum vitæ*, may occasionally be seen in wood collections. The origin of this wood is not generally known, but it seems to be the produce of an Euphorbiaceous plant, probably a species of *Croton*. The bulk is obtained from Madagascar, and some from Zanzibar. It is generally supposed, however, to be the produce of Zanzibar, probably on account of that from Madagascar passing by way of Zanzibar in course of transit to India, to whence it is mostly shipped, chiefly, it is said, for the purpose of burning the bodies of Hindoos, as it fetches a much lower price than the true sandal-wood. The wood of the *Santal Vert*, though small, is sometimes used in Mozambique for furniture. A species of *Croton* found by Dr. Kirk on the Zambesi produces a similar wood; indeed, it may be identical.

SOME RESULTS OF THE "POLARIS" ARCTIC EXPEDITION

IN a letter to the French Geographical Society, published in the March *Bulletin*, Dr. Bessels, the principal scientific member of the *Polaris* Arctic Expedition, rebuts some of the statements published by Mr. Tyson, and gives some of the scientific results which were obtained. The position of the Observatory, obtained from many varied observations, was 81° 38′ N. lat., 61° 44′ W. long., and thirty-four feet above sea-level. Many careful observations were made on the tides, in meteorology, magnetism zoology, botany, geology, and with the pendulum, in order to determine the force of gravity. Unfortunately, in the catastrophe which happened to the ship, many of the results of these observations were lost; nevertheless, enough was saved to afford a fair idea of the physical geography, the geology, the fauna and flora of the region visited. Dr. Bessels is preparing a detailed account of the results obtained, and we believe has given much valuable information for the use of our own Arctic Expedition.

The pendulum observations are specially precise and valuable. The magnetic observations are more complete than any hitherto made in the polar regions. The observations on declination were made every hour for five months, and during three days in each month every six minutes. The western declination was found to be 96°, and the absolute declination 84° 23′.

The observations on the tides were made with very great care, generally every hour, and for three or four weeks every ten minutes, in order to obtain the precise moment of the flux and reflux. High water occurs about every 12h. 13m.; the highest flux observed was 8 feet; the lowest reflux, 2·5 feet; mean of high and low tide, 3·8; mean of spring tide, 5·47; mean of neap tide, 1·83. Other hydrographical observations comprehend soundings, temperatures at various depths, and detailed observations on the specific gravity of the water.

After having entered Smith Sound, a current was observed running southwards, the rate of which varied from 1·5 to 5 miles. This current carried with it much drift-wood, all the specimens of which seen by Dr. Bessels were coniferous, with very close ligneous layers, indicating that the specimens came from a cold climate.

The greater part of the meteorological registers were saved, embracing observations on the temperature of the air and on barometric oscillations, anemometric and hygrometric results, observations on terrestrial and solar radiation, on polar auroræ, and on ozone.

The fauna and flora of Hall's Land are very rich, but unfortunately nearly all the specimens collected were lost. Eight species of mammals were observed, twenty-three kinds of birds, fifteen species of insects, and seventeen species of plants. Of the mammals, *Myodes, spr.* (Pallas) and *Ovibos moschatus* (Zimm.) were found in West Greenland for the first time. The greater part of the insects are Diptera, of which one species is new.

Although the geological formation of Polaris Bay and its neighbourhood presents only Silurian limestone, containing few fossils, yet some very interesting observations were made. At elevations of 1,800 feet, not only was drift-wood found, but also shells of molluscs (*Mya*, &c.), of species which still exist in the neighbouring seas. On examining some of the small lakes which abound in the region, marine crustaceans were found to be living in these fresh waters. This is certain evidence of the gradual elevation of the coast of this part of Greenland.

Wherever the country is not too steep, large numbers of erratic blocks are met with, of a kind quite different from the rocks on which they rest. There are blocks of granite, gneiss, &c., from South Greenland, and these blocks have evidently been borne, not by glaciers, but by floating icebergs; a proof that at one time the current in Davis Strait had a different direction, and passed from south to north. Dr. Bessels believes that Greenland has been separated from the American Continent in a direction from south to north.

ON THE OCCURRENCE OF A STONE MASK IN NEW JERSEY, U.S.A.

THE occurrence of stone "masks," such as the specimen referred to, has been somewhat frequent, in and about the "mounds" of the Ohio and Mississippi Valleys, but not eastward of these localities. Somewhat more